

Barriers to identifying occupational asthma among primary healthcare professionals: a qualitative study

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ABSTRACT

Introduction Occupational asthma (OA) accounts for one in six cases of adult-onset asthma and is associated with a large societal cost. Many cases of OA are missed or delayed, leading to ongoing exposure to the causative agent and avoidable lung function loss and poor employment-related outcomes. Enquiry about work-related symptoms and the nature of work by healthcare professionals (HCPs) is limited, evident in primary and secondary care. Potential reasons cited for this are time pressure, lack of expertise and poor access to specialists. **Aim** To understand organisational factors and beliefs and behaviours among primary HCPs that may present barriers to identifying OA.

Methods We employed a qualitative phenomenological methodology and undertook 20–45 min interviews with primary HCPs in West Midlands, UK. We used purposive and snowball sampling to include general practitioners (GPs) and practice nurses with a range of experience, from urban and rural settings. Interviews were recorded digitally and transcribed professionally for analysis. Data were coded by hand, and thematic analysis was undertaken and determined theoretically until themes were saturated.

Results Eleven HCPs participated (eight GPs, three nurses). Four themes were identified that were considered to impact on identification of OA: (1) training and experience, (2) perceptions and beliefs, (3) systems constraints, and (4) variation in individual practice. OA-specific education had been inadequate at every stage of training and practice, and clinical exposure to OA had been generally limited. OA-specific beliefs varied, as did clinical behaviour with working-age individuals with asthma. There was a focus on diagnosis and treatment rather than attributing causation. Identified issues regarding organisation of asthma care were time constraints, lack of continuity, referral pressure, use of guidelines and templates, and external targets.

Conclusion Organisation and delivery of primary asthma care, negative OA-related beliefs, lack of formal education, and exposure to OA may all currently inhibit its identification.

INTRODUCTION

Occupational asthma (OA) is defined as asthma caused by inhalation of an agent encountered at work. Most cases occur following exposure to a respiratory sensitising agent, and a number of high-risk occupations

Key messages

- Asthma care may not be organised in a way that supports attribution of an occupational cause.
- Primary healthcare professionals involved in delivering asthma care lack training and clinical experience in OA and display negative beliefs about its occurrence.
- We have identified four themes that present barriers to identifying OA in primary care and made recommendations for medical education and for clinical practice based on these findings.

are described (eg, bakers, paint sprayers). OA is relatively common among working-age individuals with asthma (population attributable fraction: 16%¹), and despite regulatory activity in the UK aiming to prevent its occurrence the incidence has increased over the last 10 years,² with novel agents frequently reported.³ Estimates suggest that OA costs the UK £1.1 billion each decade in terms of healthcare costs, job loss and state benefits.⁴ Early recognition of OA, and removing the affected individual from the causative exposure, offer the best chance of a full recovery.⁵ UK asthma guidelines recommend that healthcare professionals (HCP) ask adults with new-onset or reactivated childhood asthma symptoms about the work-relatedness of their symptoms and the nature of their work, in order to screen for OA.⁶ OA should be excluded in those with work-related asthma symptoms, usually achieved via referral to a respiratory specialist with expertise in diagnosing OA (a handful of such specialists exist⁷).

In the UK, OA is under-reported to surveillance schemes⁸ and under-recognised by HCPs. This is evident in primary care, where the prevalence of clinician-diagnosed OA is much lower than expected among working-age individuals with asthma.^{9 10} Furthermore, there are lengthy delays between symptom onset and diagnosis of OA (median 4 years), which may lead to adverse health and

employment outcomes.^{11 12} Patients with OA lack awareness and understanding of the nature of work-related symptoms, and some are reluctant to seek help for fear of job or financial loss.^{13 14} Enquiry about the nature of work and work-related symptoms by primary HCPs is limited, and insufficient time, lack of expertise and poor access to specialist services have been cited as reasons for this.^{15–18} However, the factors that determine how HCPs behave when consulting working-age individuals with asthma, and the barriers to enquiry about work-related asthma symptoms, have not been studied in detail.

Aim of the study

The aim of this study was to explore and understand organisational factors and beliefs and behaviours among primary HCPs, which may present barriers to identifying OA in primary care.

METHODS

Reporting of study methods and results was undertaken according to the Standards for Reporting Qualitative Research.¹⁹

Study design

The study employed a phenomenological approach, in the interpretative tradition, using qualitative analysis of interviews with primary HCPs.

Setting

Interviews were undertaken with HCPs currently working at UK primary care practices in West Midlands, within 40 kilometres of the lead author's institution (radius chosen for convenience).

Eligibility criteria

Any practising, fully qualified general practitioner (GP) or practice nurse attending working-age patients with asthma was deemed eligible for the study. All participants were required to speak English during their interview.

Sample selection

Purposive sampling was undertaken, targeting GPs and practice nurses from urban and rural settings who were likely to have a range of experience with working-age individuals with asthma during their training and practice. Further snowball sampling of professional acquaintances was also undertaken, by asking participants identified via educational seminars to recommend colleagues.

Participant recruitment

The number of participants was determined by saturation of themes, although it was expected to be less than 15, since a small number has previously been deemed adequate for narrow research questions.²⁰ The primary

author had delivered free educational seminars on work-related lung disease, specifically for primary HCPs, since 2015; during seminars undertaken in late 2018, attendees were given an email address to contact if they were interested in participating in the study. Inducements of £75 were offered to any HCP attempting the interview, except for participant 1. Participant 1 was the wife of the lead author and her interview was undertaken as a pilot, in order to check audio and comprehension of question phrasing. Preinterview, there was no intention to include its data, although once completed the authors felt that it yielded data worthy of inclusion in the analysis. Participant 1 highlighted the study among professionals (participants 2 and 3) from the same practice group, who were subsequently included. Additionally, participants 8, 9 and 10 were snowball-sampled from the same practice as participant 6.

Data collection

All interviews were undertaken face to face by the primary author at participants' homes or places of work; written informed consent was sought preinterview. Interviews lasted between 20 and 45 min and were conducted according to a semistructured schedule written by the primary author, based on his clinical experience, with previously published data in mind (online supplemental file 1). All interviews were audio-recorded using a handheld digital Dictaphone; no file notes were taken.

Data transcription

Digital audio files were transcribed by a professional typist. Standard UK written English was used and common abbreviations preagreed. The actual words used (including acronyms, abbreviations, slang, aborted sentences) were transcribed, but since conversation analysis was deemed less important in this study, other nuances of talk were not included (eg, non-verbal features, intonations, stutters). Social conversation before and after each interview was not transcribed.

Thematic analysis

The interview transcriptions were analysed by the primary author, with coinvestigator CMB acting as a critical friend.^{21 22} Open coding was undertaken (no pre-existing codes, developed and modified throughout coding process).^{23 24} Analysis was predominantly theoretical, answering the research question, rather than inductive. A preliminary analysis was undertaken by the primary author after seven interviews, and domains that required further enquiry were highlighted. Further interviews were undertaken aiming for saturation of themes.

Reflexivity

The interviewer (GIW) was a 43-year-old, male, white British National Health Service (NHS) consultant physician with a specialist interest in OA. He was trained in

Table 1 Summary of participant healthcare professionals undertaking semistructured interviews with the researcher

Participant	Gender	Job title	Formal respiratory or occupational health role?	Years of experience in primary care	Location of practice
1	Female	Salaried GP	No	4	City centre
2	Female	GP partner	No	28	City centre
3	Male	GP partner	Current practice respiratory lead	14	City centre
4	Male	GP partner	Previous GPSI in COPD for 5 years	20	City suburb
5	Female	Practice nurse	No	30	MOD site
6	Female	Practice nurse	No	23	City suburb
7	Male	GP partner	No	4	Semirural
8	Female	GP partner	No	7	City suburb
9	Female	GP partner	No	20	City suburb
10	Female	Practice nurse	No	15	City suburb
11	Male	GP partner	Current practice asthma lead	34	Semirural

COPD, chronic obstructive pulmonary disease; GP, general practitioner; GPSI, GP with a specialist interest; MOD, Ministry of Defence.

hospital medicine in the late 1990s–early 2000s and had no personal experience of working in primary care. GIW had preconceived ideas about the cause of poor or delayed identification, through his own training, clinical observations and previous research undertaken; he was potentially unknowing of many organisational aspects of primary care at the time the study was undertaken.

RESULTS

Descriptive analysis

Eleven HCPs participated in the study (summarised in [table 1](#)), comprising four female and four male GPs (median experience 17 years) and three practice nurses (median experience 23 years). Of the six individuals who made contact following a seminar, all consented and became participants.

Qualitative analysis

Four themes impacting on whether HCPs were likely to suspect and investigate patients for OA were identified: (1) training and experience, (2) perceptions and beliefs, (3) systems constraints, and (4) variation in individual practice (summarised in [table 2](#)).

Theme 1: training and experience

Six out of eight GPs described little or no formal exposure to OA during undergraduate or postgraduate study. Three GPs recognised that occupational respiratory disease featured during their undergraduate study, although the focus was not OA (eg, pneumoconiosis, mesothelioma). Eight GPs gained continuous professional development (CPD) by attendance at a short general topic update course, which included asthma management; two GPs recalled that OA was mentioned, although stressed that the emphasis was on diagnosis of

asthma and its treatment. Two nurses described having little formal training in asthma management, with no emphasis on OA, since beginning their professional roles.

(re: undergraduate education) I can just imagine it was like one lecture with a table or something that you probably learn for an exam and never refer to again, and it didn't feel like it's an inherent part of your assessment of respiratory disease. (P3)

In current roles, three GPs had no experience of OA at all and five GPs or nurses described some limited experience. Three GPs suggested that their experiential learning in asthma depended on previous job specialty, content of training rotations, and expertise and interests of trainers and colleagues. Three HCPs cited personal or family experiences as influences on their current understanding of asthma and OA. All participants noted that primary care had changed to include specialist areas of practice, with nurses, nurse practitioners and dedicated GPs taking on greater responsibilities for chronic respiratory disease diagnosis and management (see online supplemental file 2).

Well we've seen people who you can see there's a correlation there, they seemed to have never had a problem and suddenly they're struggling, and there is definite link there. So yeah, I can't think I've seen lots of people, but I've probably seen a handful of people like that. (P3)

And all of us have had other influences. Because I have to admit, my asthma management is influenced by our eldest, who had asthma reasonably badly as a child and they grow out of it. So I find that my individual experience of how people deal with it almost informs me. (P2)

Table 2 Summary of themes, subthemes and codes derived from analysis of interviews with GPs and practice nurses

Theme	Subtheme	Codes
1. Training and experience	Limited feature in undergraduate education.	Little formal medical school exposure to OA. Focus on other occupational or exposure-related aspects of respiratory disease.
	Limited feature in formal postgraduate education.	Not a formal part of GP vocational training. Little focus on OA in asthma-related CPD. Little formal training on asthma management for practice nurses. Likely only to do asthma-related CPD if in a respiratory role.
	Limited feature of experiential ('on-the-job') learning.	OA a feature of experiential learning. OA not a feature of experiential learning. Exposure to specific disease areas varies between individuals during formative experiences. Personal experiences have influenced practice more than any experiential learning.
	Primary care asthma diagnosis and management have become a more specialised task.	Some GPs take on the responsibility for management of respiratory diseases within the practice. Some GPs have become deskilled at asthma management. Some GPs see individuals with asthma only in certain circumstances. Increased GP workload has resulted in practice nurses taking on more asthma management. Some practice nurses are the respiratory experts within practices. Individuals with asthma receive chronic disease management in specialised clinics, primarily delivered by practice nurses and nurse practitioners.
2. Perceptions and beliefs	Variation in subject knowledge.	Appreciation of factors in the clinical presentation suggestive of OA. GPs lack knowledge about OA. OA perceived to be a specialist subject. Unable to relate learnt enquiry about exposures (eg, birds, chemicals) to OA. Variation in understanding of high-risk exposures for OA.
	Beliefs about the occurrence of OA.	Different ideas about the impact of OA on individuals and collectively. Work-related symptoms are trivial. Work exposures trigger, not cause, asthma in susceptible individuals. Onset of asthma in adult life is not unusual. OA is not prevalent in the local patient population. OA is underestimated in primary care. OA is a historical problem.
	Perceived risks and benefits of making a diagnosis of OA.	Jeopardy for patients' jobs and income if investigated further. Potential health and employment benefits for affected patients.
	Specialist care adds value in diagnosing and managing OA.	Complex and challenging diagnostic process for OA. Workplace management requires specialist knowledge. Central coordination of cases is important in identifying outbreaks of OA or novel causes.
	Beliefs about the role of primary care in diagnosing OA.	Responsibilities for diagnosis and management of OA lie outside the NHS. Shared responsibilities between primary and specialist care. Certain level of knowledge should be attained in primary care.

Continued

Table 2 Continued

Theme	Subtheme	Codes
3. Systems constraints	Lack of continuity of care.	Patients are looking for a quick fix.
		Less opportunity to explore social aspects of health.
		Poor continuity of HCPs between consultations.
	Time pressure and workload.	Priority is to make a diagnosis of asthma.
		Lack time for detailed enquiry and diagnosis of OA.
	Use of guidelines.	No OA-specific guidelines used.
		Use of asthma guidelines varies between individuals and practices.
		Clinic templates do not focus on OA.
	External targets.	Practice driven by essential requirements only.
		Focus on diagnosis and drug management of asthma.
Perceived as a tick-box exercise.		
Referral pressures.	Perceived restrictions on referrals.	
	Diagnosis and management of OA would be an ‘acceptable’ reason to refer to a specialist.	
	Feel a pressure to reduce unnecessary referrals.	
4. Variation in individual practice	Variation in clinical enquiry about work and OA.	Enquire about work-related asthma symptoms or not.
		Enquire about occupation and nature of work or not.
		Would not revisit the cause if diagnosis of asthma already made.
	Different thresholds or referral to a specialist.	Would refer on suggestive history for OA alone.
		Would not refer on suggestive history for OA alone.
	Referral preferences.	Would refer to local secondary care physicians.
	Perceived difficulty in accessing occupational lung disease services.	

CPD, continuous professional development; GP, general practitioner; HCP, healthcare professional; NHS, National Health Service; OA, occupational asthma.

Theme 2: perceptions and beliefs

Four GPs stated that they lacked OA subject knowledge, and one perceived OA to be a specialist subject, out of scope for general practice. Four GPs found it difficult to contextualise information gathered about exposures. Two GPs believed knowledge work and office environments carried no risk for OA.

I don't know if GPs would have any knowledge of what it might be that's causing their asthma... Very occasionally, they'll [patients] come with a leaflet of all the chemicals they use but I don't understand that any more than they do...that's one of the reasons we are GPs because we don't want to deal with something in great detail day in and day out. That's not the sort of people we are. (P4)

And you know, you start on the wards and you've got your list of questions, systems review stuff isn't it, and pets and pigeons and all that kind of stuff... it felt irrelevant at the time. But it was on your list so you just blindly ask it without perhaps thinking 'Why am I asking these questions?' (P3)

Beliefs about the occurrence of OA are detailed in table 3; many of these imply that OA has little impact on society, locality or on individual practice. However, seven

HCPs recognised health and employment benefits for affected individuals, comprising certainty and clarity of diagnosis, validation of symptoms and ill health, symptom and functional improvements, and retention of employment and income. Workforce and public health benefits were also cited: identifying novel causes, controlling local outbreaks and avoiding similar harms to other workers. Eight HCPs saw jeopardy in making a diagnosis of OA, including inducing fear of and actual job loss, difficulty finding alternative, unexposed skilled work, and false diagnoses leading to avoidable job loss. The majority of HCPs believed that involving specialists (either respiratory or occupational health) added value over primary care, in terms of complexity of diagnosis, time resource required, interpretation of tests and managing the workplace aspects. Opinions varied on where the responsibility for identifying OA lay and the role of primary care:

Our job is just to point people in the right direction. I think the idea that GPs are going to make these diagnoses and have the knowledge to know what to do with it... it is complex stuff, isn't it? (P4)

If you define what it is and you can somehow avoid the trigger and therefore everything is fine and you can just do your standard sort of approach to

Table 3 Beliefs about the occurrence of OA

Code	Examples
Different ideas about the impact of OA on individuals and collectively.	<p>"And when we've suspected It [OA], it doesn't feel like it's having a massive impact on patient's lives. They sort of seem to kind of say 'Oh yeah, I feel a bit wheezy there, but I'm alright when I get home.'" (P3)</p> <p>"I don't see lots of people saying, 'My occupational asthma is ruining my life.' In that regard, it's not high up the list of things we worry about. We probably miss a lot of it. Everyone is exposed to all the particulates that around here because we're in the middle of the inner city and a mile away from an incinerator. I guess that's more relevant. Around here, a lot of our patients have hard lives. If you said to my colleagues, 'Give us a list of your Top 10 things you're worried about,' occupational asthma would not be on it." (P4)</p> <p>"There's no doubt I'm sure it is very significant to somebody who has got it, and it's got to have a societal impact if it's stopping people working, especially those in skilled jobs, who we need doing those jobs. If they can't work then that's clearly got a societal impact." (P1)</p> <p>"But I think it is important though, it is certainly important because it affects a person in their prime when they can work and it is going to impact on their living and day to day activities. They can't even offer to take time off to come and see the GPs, you know, to get appointments so it certainly has." (P8)</p>
Work-related symptoms are trivial.	<p>"The only thing would be, occasionally, patients, will say you know 'Since I've worked in that factory, I don't like the smell of the paint' or that sort of thing... But I have to say, I've never taken it very seriously if people say things like that." (P2)</p>
Work exposures trigger, not cause, asthma in susceptible individuals.	<p>"One of the problems actually is I think my belief is that you are kind of born with a susceptibility to it [asthma], we can all be pushed to wheeze if we're pushed far enough; but that your tendency to wheeze is sort of what you're born with, and it's sort of an endogenous thing, and not to do with what you're exposed to in the future." (P2)</p> <p>"I've always been sort of historically [sic] you've had a tendency and that's the trigger. But in terms of it actually bringing it all on, I've never really thought about that, no. I guess you can get sensitised to stuff and presumably react and whatever." (P3)</p>
Onset of asthma in adult life is not unusual.	<p>"I don't think that's a prevalent view amongst GPs [that adult-onset asthma is unusual]. It's a bit like if someone comes in with hypertension, you don't necessarily go back to saying, 'Have you really got hypertension?'" (P4)</p> <p>"We were always told asthma could come on at any time at any time of life and not that it was unusual. It's made me think more about when it is adult asthma we should be looking more into occupation." (P6)</p>
OA is not prevalent in the local patient population.	<p>"I don't know how many cases that might be occupational we would have in our registered population, but presumably none of us are seeing that many of them. I don't think the area that we are in, there isn't much industry which would be relevant." (P1)</p> <p>"A lot of our patients don't work. They might be working age but a lot of them aren't actually employed... Even a practice this size, I'd be surprised if we have 20 patients for whom occupational asthma is their main diagnosis. That's as rare as all the kids we've got with genetic disease." (P4)</p> <p>"This is rare stuff for us I would say. One in 6 [occurrence of OA amongst asthmatics] was a surprise, I would've said if it was 1 in 6 in our population we'll be missing a lot. Yeah, it's a rare diagnosis. That's hard though because it is rarer in our environment because we haven't got a lot of people that work in industry as such, or we're missing a lot." (P11)</p>
OA is underestimated in primary care.	<p>"I think it seems to be very underestimated. You hear a lot about smoking and the impact that not smoking in public places has done and actually it's things like people not wearing masks in various jobs that they do." (P7)</p> <p>"Well I know the statistics are slightly that GPs undermanage existing asthma, and there's a lot of talk that we over-diagnose, but we also under-diagnose. So we're not very good at screening out the right people. And I know there's been a lot of fuss about that recently. So that makes me think do we do under-diagnose, so maybe there are people out there that we haven't really sort of sorted out... But if you ask me is it occupational, well now I'm beginning to think 'What am I missing?' But I would've just thought 'Oh, it's asthma'. I wouldn't attribute it to triggers very often." (P2)</p>

Continued

Table 3 Continued

Code	Examples
OA is a historical problem or associated with traditional industry.	<p>"I do think of it as a slightly historical thing, as we were saying, because you think surely in this day and age health and safety, you wouldn't be allowed to do it if it was that dangerous. But you certainly come across people working long hours or doing repetitive things and they get muscular skeletal conditions, people stressed by poor management. So actually, there is quite a lot of work-related stuff, but in terms of respiratory, the only things that I can think of causing a problem are more an allergy. I was thinking farmers, farm workers... I think of occupational respiratory problems as the asbestosis and coal mining, those sorts of things. So, it barely enters my consciousness really." (P2)</p> <p>"I'd be more surprised if someone pitched up and said, 'I'm in a cabinet with no mask and they're pumping this gas through.' Whereas 20 years ago, that was probably commonplace, I guess." (P4)</p>

GP, general practitioner; OA, occupational asthma.

treatment and everything seems stable, then yeah, I think it's fine to absorb that in general practice. (P3)

I'm assuming there is legislation around occupational asthma and hazards... So, I'd kind of feel like I was out of my depth. And I suppose that's where I'd see the shared care bit really, is the occupational team looking after that and the general health with me. (P7)

Theme 3: systems constraints

A number of issues were identified around the organisation of services, either nationally or locally, generically or specific to asthma care.

Lack of continuity

One GP suggested that patients were no longer interested in durable doctor–patient relationships. One GP reflected on a progressively 'shallower' understanding of her patients' lives due to time pressure. One GP reported that the combination of short appointment times and lack of continuity between HCPs had led to repetition of enquiry and investigation, which would impede attributing causation for asthma.

Time pressure

Nine HCPs cited time pressure as a barrier to recognising OA, with many prioritising asthma diagnosis and medical treatment over cause attribution. Two described the experience as 'inadequate' or 'feeling like survival'.

That's why I don't now work for the NHS because I refuse to do an inadequate job and the time given is inadequate and it doesn't allow you to do things properly. (P5)

However one GP disagreed somewhat:

Yeah, our days are longer, but I don't think I'm less likely to make that diagnosis because I'm so time poor with the patient any more than I used to be. (P11)

Guidelines and clinic templates

There was no knowledge or use of OA-specific guidelines among HCPs, but four HCPs recalled sections on OA in generic asthma guidelines. Some suggested that use of asthma-related guidelines varied between practices and/or individuals, and any protocols were subject to external influences, such as area prescribing committees, or locally commissioned asthma care standards. Four GPs described using clinic templates designed locally or adapted from published templates, although made no reference to OA or work.

And I know certainly on whatever template we've got, there isn't a question about work, what is work or are your symptoms worse at work, which probably we do need to think about doing that. I wonder if maybe that could be some of the mismatch between us seeing it, it not ending up in secondary care. (P3)

External targets

The national quality programme for primary care, the Quality Outcomes Framework ('QOF'), was identified by almost all HCPs as the major influence on organisation and delivery of primary care asthma services, and in turn how and which data were captured: exclusively electronically, usually via a template, and with a focus on data essential for QOF (asthma control questionnaires, treatment strategy); however, on occasion, there appeared to be local variation in QOF requirement. For some HCPs this was perceived as a 'tick-box' exercise or income-oriented, and not individual patient outcome-centred.

We'll go through the proforma, look at their symptoms and do their Asthma Control Test, and if it all seems okay, we'll say, 'Right, carry on'. There's no incentive to make a diagnosis of occupational asthma. (P4)

You are driven in part by what QOF requires you to do and it might have a template with multiple boxes on it and one of those could well be 'Did you ask about occupational asthma?'. But if it's not QOF-able

and the patient's saying 'I'm fine, doctor', I'm not touching that. (P11)

External pressures on referral

There was consensus among all seven HCPs who commented that referring a case of suspected OA to a specialist would be 'reasonable', defined variously in terms of rarity of disease, complexity of investigation and management; that is, the referral added 'value' over primary care, but was also acceptable under scrutiny from colleagues or other agencies. Most HCPs perceived pressure on their referral practice; some, not all, had referrals 'monitored' within the practice or clinical commissioning group (CCG) and were keen to avoid referrals deemed unnecessary (ie, specialist unlikely to add value), or appearing to have too low an index of suspicion for diagnosis, and being an outlier within the practice (more referrals than their colleagues) or CCG (more referrals than average).

I think we all feel under pressure to reduce referrals, because we are under pressure to reduce referrals. So, we now have a referrals MDT every week, and we look for ways that we can perhaps manage the patient within the practice, or avoid an unnecessary referral ... All of our thresholds for referring anything that is not suspected cancer has had to go up. (P1)

Theme 4: variation in individual practice

Clinical enquiry

Of 11 HCPs who commented on their own clinical enquiry, 5 would unconditionally ask individuals with asthma about work-related symptoms, 4 conditionally (uncontrolled or new adult-onset symptoms, in a high-risk job) and 2 not at all. Seven HCPs commented on enquiry about occupation and the nature of work: four would ask unconditionally, two would not routinely ask, and one conditionally, only in the context of new-onset asthma. Two GPs described a tendency not to revisit the cause once a diagnosis of asthma had been made.

It's not something that I've really thought about before if I'm honest. I tend to focus on the house, like is it dusty, have you got a cat, have you got dogs, have you got birds? Not so much the job. I've not come across it because I wouldn't normally ask. (P10)
I wouldn't say that I'm proactively asking questions but what I do find is that patients are quite well aware when there is something that triggers their problems. They do figure it out usually and they will tell you. (P9)

Referral thresholds

Of six GPs that commented, three would make a referral based on a suggestive medical history only, and three would want further investigations first (peak flow measurements). Qualities of a good referral were cited as: tests or opinion required but unavailable in primary

care, a positive diagnosis of OA likely, meets specialist's (presumed) expectation that 'basic' tests had already been carried out.

I think the idea of doing occupational peak flows and all the rest of it... we don't have the wear-with-all to do it, to be honest, or the time to explain to the patient. We have seven [minutes]... our job is to be more aware and screen for the patients and then refer on, I guess. (P4)

You know, you don't want to be too quick on the trigger on referral... We've been brought up with the 'history, examination, investigation' model, and I think you are duty-bound as the GP to try your best to put it on a plate for the consultant. (P11)

Referral practice

Three of four HCPs that commented were unaware of any regional referral centre for occupational lung diseases, and one believed that they would be unable to refer directly, needing to send patient to a local respiratory service first. Eight HCPs reflected on their own referral practice, which in all cases would be to refer a patient with suspected OA to a local secondary care provider first. Three HCPs mentioned that they might access their local electronic 'Advice and Guidance' service.

We just do it electronically now. There is a slight frustration because it is quite difficult sometimes to pick your consultant of choice. If I wanted you [interviewer], particularly, to see the patient, it's not that easy. (P4)

DISCUSSION

Limitations and generalisability

Four distinct themes were identified, although others unknown to the researchers due to their background in hospital medicine, and not considered by the interviewees, could have been missed. Only one salaried GP was included and no doctors-in-training, who may have had a different perspective on training, although the range of experience of GPs was in fact broad (4–34 years). The study was sufficient to highlight the effect of differences in experience and training among GPs, although all routes through GP training are unlikely to have been accounted for, given the limited sample size. The small number of practices included and their geographical location (West Midlands) may also limit generalisability of findings, relating to training and local operating procedures. Many participants may be considered enthusiasts, having attended an evening symposium on OA, leading to selection bias (although there are in fact many reasons why HCPs do so). There was also therefore some preconditioning on the subject of interest, although most participants qualified their thoughts and behaviours as relating to presymposium (no explicit direction on this had been given before the interview). In order to increase truthfulness, thematic analysis was undertaken with a critical

friend (CMB) and an audit trail was created for coding and organisation of themes. Interviews were undertaken at participants' convenience, and they were encouraged to talk truthfully and openly, although ultimately some may have been reluctant to talk about aspects of their individual practice, if they perceived these to be different from others or 'wrong'. Generally, however, these were felt to be generous and truthful accounts.

Training and experience

There was little focus on OA, or indeed on occupational health aspects of disease, evident during formal periods of training. Descriptive knowledge learnt tended to relate to asbestos, coal dust or non-specific pollutants (eg, dust, fumes), and not agents or jobs specific to OA; many GPs were unclear what to do with information gathered about occupational exposures, in the context of asthma. Process-oriented targets for asthma, and CPD seemingly aligned to these, are currently focused on objective diagnosis, establishing treatment and good asthma control (all worthwhile goals per se), but have deprioritised finding a cause. From the medical literature, physicians self-report low awareness of OA and lack OA-specific education, and cite complexity (too many causes, detailed occupational history required) as a barrier to diagnosis.^{17 25} Thus, in acute hospital and primary care there is little clinical enquiry about OA, and opportunities to detect OA are missed.^{26–28} An evidence-based e-learning module on OA can increase knowledge and use of guidelines among primary HCPs.¹⁵

Individual beliefs and practice

Many negative beliefs about the occurrence of OA and its social impact were evident and are likely to inhibit clinical enquiry. Parhar *et al*¹⁷ reported two factors leading physicians to attribute asthma to work: other work colleagues are affected, or the physician had previously attended a case due to the same causative agent. The perception of low prevalence of OA may be self-fulfilling since a missed diagnosis may not subsequently be recognised at all. The societal burden of OA is in fact high,⁴ and the incidence has not decreased since new causes and 'at-risk' industries emerge, as others disappear.²

Referral practice was predisposed by individual beliefs about the worth of a referral, that is, whether it reached thresholds of 'acceptability' and 'quality' described earlier, in part influenced by external pressures. However, all participants that commented saw advantages for specialist referral of suspected OA, due to the complexity and uncertainty of both diagnosis and management. Most HCPs would refer cases to a local secondary care physician, either through unawareness of an NHS occupational lung disease service (which may be a local phenomenon) or because local policy dictated so. A model explaining the variation in individual behaviour and potential barriers to identifying OA is shown in figure 1.

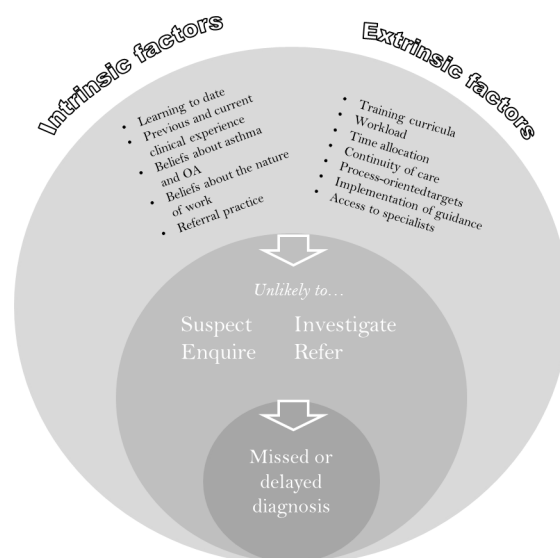


Figure 1 A conceptual model describing extrinsic factors and individual healthcare professional-oriented influences on missed or delayed diagnoses of occupational asthma (OA).

Systems constraints

There were a number of negative extrinsic influences on practice, specifically: lack of continuity of care, time pressure and increased GP workload, external targets, referral pressures, and lack of guideline use. The result has been that identifying an occupational case for asthma is a low priority for primary HCPs, who are not incentivised to do so. Some HCPs felt that lack of continuity, time and increased workload meant that they were unable to know their patients' lives in detail as they used to, to the detriment of holistic care. MacKinnon *et al*²⁵ suggested that lack of systematic screening for OA in primary care contributes to delayed diagnosis, although acknowledged that the optimal screening tool is currently unknown. Others have previously cited time constraints and lack of access to specialists as barriers to diagnosis.^{17 18}

CONCLUSION

Although specific guidelines are published relating to identification and referral of suspected OA,^{6 11} there are limitations to the current model for primary asthma care that inhibit recognition and onward referral to a specialist. Additionally, lack of provision of formal education at each stage of training and variation in clinical experience are likely to influence disease-specific beliefs for HCPs, and inhibit further action in at least some cases. Recommendations for education and clinical practice are considered in table 4. Whether screening individuals with asthma in primary care for OA is helpful, and the optimal tool for doing so, are both currently unknown and require evaluation.

Contributors GIW undertook the study design, interviews and data analysis, with CMB acting as a critical friend. Both authors wrote and edited the manuscript.

Table 4 Recommendations for healthcare education and clinical practice

Education	<p>Broadly, understand cause and effect with respect to occupational disease and the effect of work on health; address these at all stages of training.</p> <p>Appreciate the value of knowing about occupational and environmental exposures in respiratory disease, particularly why it may be beneficial to attribute causation to work, in terms of health and employment outcomes for workers. Contextualise the declarative knowledge of individual causes or relevant occupational exposures.</p> <p>Challenge perceptions that OA is a 'historical' disease by teaching about novel causes and novel and prevalent exposures and surveillance systems.</p> <p>Highlight the benefit of early diagnosis and referral to a specialist (where indicated) in terms of health and employment outcome; have a low threshold for suspecting OA.</p> <p>Ensure that continuing professional development on OA reaches those who are seeing working-age individuals with asthma, that is, respiratory-oriented GPs, practice nurses and advanced nurse practitioners.</p>
Practice	<p>Promote and make asthma OA guidance accessible, either specifically or within generic asthma guidelines.</p> <p>Encourage dialogue between generalists and specialists on OA through mutual education and practice.</p> <p>Collect data useful for identifying OA, for example, work-related symptoms, job roles and any changes in employment or role.</p> <p>Review local policies and pathways to ensure there is a secure pathway for referral for investigation of OA and for specialist advice.</p> <p>Incentivise healthcare professionals to make a diagnosis of OA by measuring health and employment outcomes rather than processes.</p>

GP, general practitioner; OA, occupational asthma.

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Competing interests Participant 1 was the wife of the primary author and a GP in a city centre practice.

Patient consent for publication Not required.

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Supplementary File 1

Semi-structured interview schedule

Demographics

1. What is your job role and how many years have you been practising since qualification?
2. Have you taken on any specific or formal respiratory or occupational health role?
3. Can you describe the primary healthcare centre you work in in terms of size and location (urban/rural)?
4. Under what circumstances do you see working-age patients with asthma symptoms? (urgent, asthma review, medication review)

Knowledge and experience

1. What does the term OA mean to you?
2. Do you make this diagnosis in primary care?
 - a. What would prompt you to make that diagnosis/suspect that diagnosis?
 - i. Are you aware of any clinical factors that might point towards this diagnosis?
 - b. Do you use any guidelines that help in that regard?
 - c. If suspected or diagnosed how do you normally manage them?
3. Do you routinely ask patients about their job, and the nature of their work?
 - a. How do you feel about talking about the nature of work with patients?
 - b. Are you familiar with jobs that might put patients at risk of occupational asthma?
4. Are you confident in how to refer on a patient you suspect to have an occupational cause for their asthma? (refer to secondary, pathway to tertiary, investigations, health aspects, employment aspects)
 - a. Do you think a referral centre adds value to the diagnosis and management?

Beliefs

1. Do you believe OA is a significant health problem?
 - a. What do you see as the benefits of making a diagnosis?
 - b. Do you see any risks/ jeopardy in it?

2. Whose responsibility do you believe it is to diagnose and manage OA
 - a. Screening and diagnosis
 - b. Management of health aspects
 - c. Management of work/employment aspects
3. How would your patients' ideas about their illness influence how you manage them? (perception of symptoms, fear of job loss)

Training

1. How well did medical school/nurse training prepare you for identifying and managing OA?
2. How well has your post-qualification practice prepared you for identifying and managing OA?
3. Has continuous professional development (CPD) influenced your knowledge and confidence in this area?
4. Have you learned about this on the job?

Organisation

1. How do local policy and guidelines influence how you manage these patients? (QOF, BTS guidelines)
 2. Are there any external factors which restrict your ability to suspect OA in patients?
 - a. Is 'time' a constraint?
 - b. Restraints on referral?
 - c. Peer practice/review?
 - d. Asthma clinic setup
 3. What specific tools do you have in primary care to help you diagnose OA? (electronic patient database)
 4. Has the way general practice is changing affected how you manage these patients?
- Is there anything else burning that you wish to add?

Supplementary File 2.

Supplementary Table. Ideas about specialisation within primary care, that may impact on identification of OA	
Code	Examples
Some GPs take on the responsibility for management of respiratory diseases within the practice	<p>[P3] <i>"There are an infinite number of new guidelines coming out, inhalers, protocols you've got to follow and as I say, I think you're seeing us all kind of increasingly become kind of specialists within the surgery... So, I think at least over the last ten years that's been a definite shift".</i></p> <p>[P2] <i>"So one partner is the respiratory lead and another doctor has helped a lot with that. So those two doctors are sort of more expert. So if we have a respiratory problem that we're thinking 'Oh maybe I should know how to deal with this', you might speak to them".</i></p>
Some GPs have become de-skilled at asthma management	<p>[P11] <i>"I think there are two things that drive the deskilling. One is that the nurses have become increasingly strong in their area...the second reason why it is, I think, is that the sort of confusing array of inhalers has been daunting. Made worse by medial-political imperatives. So 'Alright, we're going to switch to this' and then we're off on another thing' and we all get slightly battle-worn about inhaler switching, when there was a very short, small little formula, you knew where you were. I'd feel very out of my depth quite quickly with the different devices and what's in them".</i></p> <p>[P6] <i>"The doctors are very good now, sort of as the years have gone on they will refer quite quickly for the nurse to see them and do the full assessment. So basically the doctors do rely on us... I think we all expect our general practitioners to be expert on everything and sometimes they don't know the guideline, they really don't".</i></p>
Some GPs see asthmatics only in certain circumstances	<p>[P9] <i>"Really, as a GP, most of the time, I see the acute exacerbations or I see them if there is a problem where the nurse brings up some problem.... Complexity or not responding to medication or some confusion about the diagnosis and stuff like that".</i></p> <p>[P4] <i>"I tend to get the complex ones that were fours and fives [SIGN/BTS stepwise management plan]"</i></p>
Increased GP workloads has resulted in practice nurses taking on more asthma management	<p>[P4] <i>"I think it's going to have to be the way [nurse-led clinics] because there just aren't enough of us anymore. Even here, we find it difficult to attract doctors to come here".</i></p> <p>[P3] <i>"Increasingly the GPs have been needed to just do general stuff and that workload [asthma management] has moved completely to the nurses".</i></p>
Some practice nurses are the respiratory experts within practices	<p>[P5] <i>"Having worked in a GP practice where the GP actually relied on me and said, 'well you know more about asthma than me, what do you want me to do?'... I suppose in a way it's nice that they would hold their hands up and turn round and say, I don't know what you're on about".</i></p> <p>[P10] <i>"Yeah, I mean I tend to go to the other nurse because the other nurses have done their diplomas in asthma. I'd probably see the nurses rather than a doctor".</i></p>
Asthmatics receive chronic disease management in specialised clinics, primarily delivered by practice nurses and nurse practitioners	<p>[P1] <i>"Previously I was seeing them for their full asthma reviews, but I do less of that now as they tend to fit them into specific clinics".</i></p> <p>[P3] <i>"So historically, there was a GP lead who used to do annual asthma and COPD reviews alongside our practice nurses who are the people that mostly do it. But increasingly the GPs have been needed to just do general stuff and that workload has moved completely to the nurses".</i></p> <p>[P7] <i>"We have two nurses who are advanced nurse practitioners who also have interest in respiratory disease as well. So a lot of our chronic disease management is done through the advanced nurse practitioners".</i></p> <p>[P9] <i>"In this surgery, the majority of the reviews and even the diagnosis is done by our very qualified nurses who take care of the chronic disease management. They do the annual reviews and they do all the QOF work as well".</i></p>

Supplementary Table. Ideas about specialisation within general practice, which may impact on identification of occupational asthma (OA). GP=general practitioner; COPD=chronic obstructive pulmonary disease; SIGN/BTS=Scottish Intercollegiate Guideline Network/British Thoracic Society; QOF=Quality Outcomes Framework.